ENVIRONMENTAL MANAGEMENT SYSTEM

INTRODUCTION

Fermilab's Environmental Management System (EMS) is a defined and integrated system of managing activities, training and communication to achieve environmental goals/objectives and targets within its overall Integrated ES&H Management System (IESHMS). The EMS describes the Laboratory's program for integrated execution and evaluation of programs for protecting the environment, assuring compliance with applicable environmental standards, and avoiding adverse environmental impacts through an effort of continual improvement. The policy for environmental protection, as stated in the Director's Policy Manual, identifies the major goals under which the Laboratory's efforts are directed to meet the EMS program objective. The original documentation of the Fermilab EMS compared against DOE identified elements (policy, planning, implementation and operation, checking and corrective action, and management review) was performed in 2003 through the gap analysis process. It was performed as an independent audit to additionally meet an annual performance measure with DOE Fermilab Site Office. The Laboratory also sets measurable goals that are achieved through the development of Environmental Management Programs. The Laboratory met its final metric to demonstrate an EMS in place through the Self-Declaration mechanism. A letter (Appendix C) was sent to the DOE Office of Science from the Site Manager on December 2, 2005 with the determination. In late 2006, Fermilab decided as part of its contract bid, to become certified under ISO14001. To help in that effort, an independent subcontractor NSF-ISR was contracted to audit the facility EMS and provide services as third party registrar. During late 2006 and 2007, NSF conducted three audits of the laboratory EMS (desk, readiness, and registration). The final registration audit was conducted in late July/early August 2007. The Laboratory received official certification under ISO14001 on August 21, 2007. Appendix D contains a copy of the certification.

The Fermilab Environment, Safety & Health Manual (FESHM) 8000 series further describes important program elements under the Fermilab EMS. It includes the following chapters:

8011	Monitoring Wells
8012	Sedimentation and Erosion Control Planning
8020	General Program Statement on Waste Management
8021	Chemical and Radioactive Waste Management
8022	Waste Minimization and Pollution Prevention Awareness Program
8023	Solid Waste Management
8025	Wastewater Discharge to Sanitary Sewers
8030	Spills and Releases
8040	Specific Chemical Hazards
8040.1	Polychlorinated Biphenyls
8040.2	Pesticides
8050	Drinking Water Protection
8060	National Environmental Policy Act Review
8070	Decontamination and Decommissioning
8080	Air Emissions Control Program

DEFINITIONS

Activities, Products, and Services – A catchall phrase that captures all of the elements at Fermilab that can interact with the environment.

Continual Improvement –Recurring process of enhancing the environmental management system to achieve improvements in overall environmental performance consistent with the Laboratory environmental policy.

Environmental Aspect – Any element of the Laboratory's activities, products, or services that can interact with the environment. This is analogous to the concept of "hazard" in safety, although an aspect under EMS can also be beneficial. The term 'significant' is applied to those aspects that have or can have a significant impact and thus rate as priority areas for establishment of Environmental Management Programs.

Environmental Impact – Any change (completely or partially) to the environment, whether adverse or beneficial, resulting from the Laboratory's environmental aspects.

Environmental Management Program (EMP) – The policies and procedures established to manage, control, and mitigate the potential impacts of specific Laboratory activities with significant environmental impacts.

Environmental Objective – An overall environmental **goal**, consistent with the environmental policy, that the Laboratory sets itself to achieve, and which is quantified where practicable.

Environmental Performance – Measurable results of the Laboratory's EMS, related to its control of environmental aspects, based on its environmental policy, objectives, and targets.

Environmental Policy – A statement by the Laboratory of its overall intentions and direction related to its environmental performance as formally expressed by top management. It provides a framework for action and for the setting of environmental objectives and targets.

Environmental Target – A detailed performance requirement, quantified where practicable, and applicable to the Laboratory, which arises from the environmental objectives and needs to be set and met to achieve those objectives.

Gap Analysis – An assessment of EMS requirements against existing management system descriptions, policies and procedures.

Hazard Analysis (HA) - The process by which hazards associated with a job or project are identified, analyzed, mitigated, and documented. The HA document shall describe each phase of work, identify all hazards associated with each phase, and the work processes to be employed to eliminate or reduce those hazards. "Hazard" in this context shall be deemed to include potential negative environmental impacts. As the project develops, new or unanticipated hazards encountered with each project phase or change in specific operations within that phase are addressed and added to the HA. By the completion of the project, the HA has evolved into a specific and detailed job hazard analysis of the entire project.

Operational Controls – Procedures that help implement the environmental policy, objectives and targets.

Self-Declaration - An assertion, both internal and external, by an organization that it is in conformance with the designated standard based on an audit of its EMS.

Senior Management – The level of management that has the authority to make decisions for the facility.

Significant Environmental Aspect – An environmental aspect that has or can have a significant environmental impact.

RESPONSIBILITIES

The Laboratory Director acts as the EMS lead. As such he is responsible for:

- Documenting, implementing and maintaining the environmental policy.
- Providing the appropriate human, physical and financial resources to implement and maintain the EMS.
- Assuring that the Lab's EMS is reviewed periodically with an eye to continual improvement.

All Division/Section Heads are responsible for:

- Assigning an Environmental Officer (EO) as representative to the Environmental Protection Subcommittee (EPS).
- Supporting the efforts of the EO in determining significant aspects for projects originating from within the Division or Section (D/S).
- Supporting the EP Subcommittee in developing and implementing Environmental Management Programs by assigning subject matter experts, as needed, to Environmental Management Program Panels.
- Ensuring that all subordinate documents developed by their D/S are consistent with and in support of the Director's Environmental policy and identified significant environmental aspects and that they meet control requirements.
- Ensuring that all environmental consequences of their organization's operations are recognized and understood.
- Ensure that periodic internal assessments of processes are conducted to determine compliance status and identify pollution prevention opportunities (Appendix E).

Environmental Officers are responsible for:

- Representing their assigned Division/Section on the Environmental Protection Subcommittee.
- Assisting D/S personnel in determining significant aspects for projects originating from within the D/S.
- Disseminating information regarding the Environmental Management System to their organization.
- Participating, as appropriate, as Chairman for specific EMP *ad hoc* panels.
- Collecting relevant information from their organization for consideration by the Subcommittee or panels.

- Recognizing and understanding the environmental consequences of operations within their organization.
- Assisting in determining requirements for compliance status and identifying pollution prevention opportunities for operations within their organization..

The Environmental Protection Subcommittee works within the structure of the Laboratory Safety Committee (Charter in FESHM 1030) and is responsible for:

- Developing and maintaining a list of environmental aspects for Laboratory activities.
- Acting as a functional group for reviewing Laboratory projects and determining aspect and compliance issues.
- Maintaining a process for establishing, evaluating and approving annual goals/objectives and targets (Environmental Management Program).
- Providing support for management review of the EMS.

The Environment, Safety & Health (ESH) Section will:

- Provide necessary training on the Lab's EMS commensurate with employee responsibilities.
- Designate the Environmental Management Systems Coordinator.
- Maintain information on the Lab's EMS and related documents.
- Ensure effective management of procedures and other system documents.
- Identify potential emergencies and develop procedures for preventing and responding to them.
- Monitor key activities and track performance.
- Conduct periodic assessments of compliance with legal and other requirements.
- Maintain and manage records of EMS performance.
- Periodically verify that the Lab's EMS is operating as intended.
- Maintain a process for identifying and providing access to relevant laws and regulations, as well as other requirements to which the Laboratory adheres.
- Provide resources and expertise as necessary to supplement Division/Section resources.
- Prepare and implement environmental monitoring and surveillance programs.
- Prepare and submit to regulatory agencies all environmental permit applications.

- Serve as the primary point of contact between the Laboratory and regulatory agencies.

The Environmental, Safety & Health (ESH) Section, Environmental Management Systems Coordinator will:

- Chair the Environmental Protection Subcommittee.
- Ensure that the EMS is established, implemented and maintained in accordance with the requirements of the governing standard.
- Report to top management on the performance of the EMS for review, including recommendations for improvement.

All Employees will:

- Recognize and understand the environmental consequences of their current and planned job duties.
- Identify, plan and manage Division/Section operations and activities in line with the Lab's policy and established objectives and targets.

APPLICABLE STANDARDS

Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management.

DOE Order 450.1, Environmental Protection Program, Appendix: Contractor Requirements Document. This DOE Order is not currently contained within the Fermilab/FRA contract with DOE. However, it is in the best interest of the Laboratory to be able to compare its current programs, plans and procedures with the Contractor Requirements Document.

ISO 14001:2004(E), Environmental Management Systems – Requirements with guidance for use.

PROGRAM DESCRIPTION

Scope

The essence of an EMS is the improvement of environmental management. The focus of the system is not only on what things happen but also on why they happen. Over time, the systematic identification and correction of system

deficiencies leads to better environmental performance. Some of the keys to a successful EMS include: commitment by top management, focus on continual improvement, flexibility, compatibility with organizational culture, and employee awareness and involvement. The scope of this program is defined in the Integrated ES&H Management Plan (IESHMP). It covers research and development, manufacturing, waste management, and site infrastructure management across the FNAL property in accordance with Contract DE-AC02-07CH11359 with the U.S. Department of Energy.

Environmental Policy

Obtaining top management commitment is the first essential element in developing a successful EMS. The importance of having and maintaining buy-in of Laboratory leaders cannot be overemphasized. The policy statement reflects the nature and scale of the labs activities, and embodies the organization's commitment to compliance with applicable laws and requirements, prevention of pollution, and continuous improvement. Fermilab's environmental policy can be found in Section 3, Number 3, of the Director's Policy Manual.

EMS Elements

The procedures for the Fermilab EMS will be documented in this chapter through descriptions of the principal elements along with their associated sub-elements.

I. Planning and Aspects Identification

Planning is the first key element in developing a successful EMS. It provides the basis for identifying environmental aspects associated with facility activities and services. Existing planning and budget documents were used to reflect upon the organization's mission, location, activities, and history. Using existing system elements, terminology, and concepts wherever possible saves time and resources and allows the EMS to fit more naturally into the facility's culture.

Identification of facility activities and listing of environmental aspects

The Fermilab EP Subcommittee took the original list of compliance elements that the laboratory developed during the Necessary and Sufficient Set (NSS) process and expanded them to include those current elements of the Laboratory's activities and services that impact the environment. The NSS process was conducted in 1995 as a pilot project to test the validity and applicability of the Department of Energy Closure Process for Necessary and Sufficient Set of Standards. It generated a number of reports to document the process, to act as a guide for others as well as the results specific to Fermilab. Production of a necessary and sufficient set of standards was accomplished through six process elements, (1) defining the work and the hazards, (2) creating the team, (3) defining and agreeing to protocols and documentation

requirements, (4) identifying the necessary and sufficient set of standards, (5) confirming the necessary and sufficient set of standards, and (6) approving the necessary and sufficient set of standards. The result was a modification of the DOE/URA contract that replaced the applicable ES&H DOE Orders with a modified list of applicable orders and the "N&S" list of Standards.

The EP Subcommittee began with those areas that linked to regulatory drivers and expanded them to include other areas in which Laboratory processes interacted with the environment. The Team identified the significant aspects of Laboratory processes to include the EMS, Releases, Materials, Energy, and Land Management. Each of these significant aspects is further subdivided, at the line level, into categories and general activities. The EP Subcommittee will review this list annually.

Impact analysis

Programs and processes that identify new environmental aspects and analyze the impacts of proposed purchases, projects and experiments can be found in the FESHM. These include NEPA (Chapter 8060), Work Permit and Notification (Chapter 2020), Utility Identification and Permit Program (Chapter 7030), Hazard Analysis (Chapters 2060, 7010, 7020), Planning and Review of Accelerator Facilities and Their Operations (Chapter 2010) and Construction Design Reviews. These programs and processes overlap somewhat depending on the size and scope. However, they serve to address the impacts on the environment that may occur as a result of going through with the proposed purchase, project or experiment.

The NEPA process is a mechanism that ensures that specific impacts of governmentally proposed projects are reviewed and the environmental information provided is useful to decision-makers and the public, by emphasizing real environmental issues and alternatives and that NEPA processes are integrated and concurrent with other required DOE decision-making procedures. Whether the project is reviewed through a project information form, an environmental assessment, or an environmental impact statement, it is designed to inform broader assessments of environmental significance under the regulations' model for DOE.

The Work Permit and Notification process is another communication mechanism for relating potential environmental aspects. This communication is

within the Laboratory's internal structure and is meant as a work planning tool to provide timely notification of a proposed activity that will have an impact beyond a particular organizational group and/or the specific system or area affected by the work. It identifies the specific permits, training, and organizations that need to be notified before work can commence. It also acts as a reminder and checklist to identify hazards that are controlled by requirements specific to Fermilab and documents the authorization to commence work by the landlord Division/Section.

The Utility Identification and Permit Program is a Fermilab internal process that must be followed when a phase of work requires an excavation. It provides the guidance regarding the actions that must be followed to obtain an excavation permit prior to any activity that requires penetration of the soil.

The Hazard Analysis process is an integral part of the work planning process and is a requirement of anyone performing work at Fermilab, including employees (temporary or full-time), visitors and subcontractors. It is a mechanism for identifying and mitigating the hazards in any work activity and assures that the hazards are defined, understood, and anticipated, whether they are inherent to or resulting from the activity.

The Planning and Review of Accelerator Facilities and Their Operations process is a formal review procedure that assures that accelerator facilities and their operations comply with Fermilab ES&H standards. It not only applies to new projects but also to existing projects when significant modifications occur. The process is documented through the Safety Assessment Documentation process. The level of review and documentation is determined by the Director's Office through the ES&H Section.

The Construction Management Process is another program used to identify new environmental aspects of construction projects. The goal being continued improvement in design and maintenance through communication and evaluation during all project development phases, including design, procurement, construction and post construction.

II. Legal and Other Requirements

a. Regulatory

The Work Smart Standards Set (formerly Necessary and Sufficient Set of Standards) itemizes all the ES&H laws, regulations, and standards to which Fermilab must adhere. FESHM Chapter 1070 describes the procedure for how Fermilab's work activities, the hazards associated with the work, and the standards and regulations are reviewed on an annual basis, and revised as needed. The procedure also allows for the review and addition of new standards and regulations promulgated by DOE or other agencies/organizations. The standards set is part of the Fermilab/FRA contract with DOE.

Federal and State regulations can also be accessed on the Internet. The Code of Federal Regulations can be accessed from the Government Printing Office (GPO) and State Regulations on the environment can be accessed at the Illinois Environmental Protection Agency (IEPA).

Relationships in environment, safety and health matters among Fermi Research Alliance, LLC (FRA), Fermi National Accelerator Laboratory (Fermilab) and the U.S. Department of Energy (DOE) and other regulatory agencies external to DOE are addressed in FESHM 1030.

b. Other

The Laboratory recognizes that there are other programmatic elements contained within DOE Order 450.1 (refer to Appendix D) that, even though they are not required contractually, are beneficial to the management of environmental issues. The elements that are currently covered by Fermilab plans include, waste minimization and pollution prevention, cultural resource protection, groundwater protection, wild land fires control, natural resource and land management, conformity of actions with State Implementation Plans to attain and maintain national ambient air quality standards (FESHM 8080), ozone depleting substances management and a strategy for stewardship and monitoring that covers the monitoring of environmental media and biota.

Waste minimization/Pollution Prevention is an integral part of the Laboratory's operating philosophy. It is mentioned specifically as a goal in the Director's ES&H Policy and procedures are documented in FESHM Chapter 8022. Each Division and Section is encouraged to set their own goals based on the Laboratory's goals. Procedures cover source reduction and recycling. Progress toward meeting waste reduction goals are reported to DOE and to EPA.

The protection of natural resources is overseen by the Facility Engineering Services Section, Roads and Grounds. The Ecological Land Management Committee (ELM) is a volunteer committee charged with making recommendations to the Director. Plans for managing the available areas of the Laboratory site according to principles of ecosystem management and restoration are documented in the ELM Committee's Long Range Management Plan.

Fermilab documents the process for preservation and management of cultural resources in its Cultural Resource Management Plan pursuant to the National Historic Preservation Act and State of Illinois legislation. This plan was prepared to fulfill the responsibility of DOE under the National Historic Preservation Act. Fermilab maintains a web-site titled, "History and Archives Project." This site offers guided access into the laboratory's historical records for the research user. It contains permanently-valued government records that are preserved and available for reference and research by both Fermilab and the general public.

Effective integration of requirements among site programs and activities to ensure that federal, state, county, local and other requirements pertaining to ground water protection and management are incorporated in a consistent, effective manner is accomplished through the Ground Water Protection Management Plan. The plan is an effort to eliminate or minimize adverse impacts of the Laboratory's operations on ground water, determine the extent and understand the impact of past activities, remediate adversely affected areas, and monitor current operations.

Controlled burning of land is an essential component of the overall land management plan at the Laboratory. The Fermilab Site Office of DOE demonstrated to the Office of Science that it has an effective review process and understanding of the prescribed burning program at Fermilab. The controls for this program are set forth in the Fermilab Non-Structural Fire Management Plan. The plan consolidates information from various sources and sets forth Fermilab's policy regarding prescribed and unplanned fires other than at structural units.

Fermilab ensures that its actions conform to Illinois' State Implementation Plan to attain and maintain national ambient air quality standards through conformance with the condition of its Illinois Air Pollution Control Operating

Permit/National Emission Standard for Hazardous Air Pollutants (NESHAP) Lifetime Operating Permit issued by the IEPA. The procedure for this process is outlined in FESHM Chapter 8080.

The management of ozone depleting substances is dealt with through a stand-alone policy of the Director (DP# 30). The policy states the Laboratory's commitment to insuring that its operations significantly reduce the use of ozone-depleting substances where practicable through recovery, recycling and conservation programs and minimize the emissions of these substances to the atmosphere with a goal of ultimately phasing out their use. This will be accomplished through the maximization of use of alternatives through cost-effective, affirmative procurement programs. The Facilities Engineering Services Section – Operation Group has the responsibility for the Laboratory's overall compliance with the refrigerant regulations associated with the EPA's Clean Air Act in fulfillment of the Director's Policy. This is accomplished through the Refrigerant Management Program. The plan strategy includes establishment of a site refrigeration manager to oversee the program, establishment and maintenance of a computerized refrigerant management program database, and communication of responsibilities to building managers. Any Fermilab employees or subcontractors removing or adding refrigerant are required to complete a refrigerant use report and submit it to the program manager.

III. Objectives, Targets and Programs

The underlying emphasis of any organization that adopts and implements an EMS is continual improvement. The mechanism for establishing the framework to achieve this is the Environmental Management Program. This program requires that the aspects that are identified to be significant in their impact to the environment be examined and then ideas generated and tested to reduce that impact. These ideas should be realized through the establishment of goals/objectives and targets. To ensure its effectiveness, the environmental management program needs to define not only what the improvement is but also what means will be used to achieve it, who is responsible, and the time frame that will be used to monitor achievement. It is important, though, to realize that, although these elements are defined, they are also dynamic in nature. The process must allow for modification of any element along the path of implementation to ensure that the focus is on continual improvement. Appendix B: Procedure for Determining Goals/Objectives, and Targets, describes

Fermilab's process. Annually the Laboratory also documents major themes and goals it wishes to express to Laboratory management within the Annual Environment, Safety & Health Plan.

IV. Resources, Roles, Responsibility and Authority

Successful implementation of an EMS requires clear articulation of environmental responsibilities across the various elements of the Laboratory. Environmental responsibilities cannot be confined to the D/S environmental representative or the ES&H Section; they must be recognized as a prime responsibility of all employees, including line management. Components of the implementation and operation element of the Fermilab EMS include:

Integrated ES&H Management Plan

It is the objective of Fermilab management to systematically integrate excellence in ES&H into the management and work practices of all activities at all levels so that the mission is achieved while protecting the public, the worker, and the environment. This is accomplished by ensuring that the overall management of ES&H functions and activities is an integral part of our mission accomplishment. As a function of this integration, it is important to recognize that the use of the word "safety" refers to the identification and reduction or elimination of all hazards, including hazards to health and the environment. The Integrated ES&H Management Plan (IESHMP) describes the integration process and references the documents that support the Laboratory's IESHM program.

Roles and Responsibilities

Successful implementation of an EMS requires clear articulation of environmental responsibilities across the various elements of the Laboratory. Those ES&H roles and responsibilities are outlined in the IESHMP, Section 3.2, and are explicitly defined in the FESHM, Chapter 1030. They are articulated to service subcontractors through the contractual Exhibit A, FESHM Chapter 7020, time and material contracts FESHM Chapter 7011 and fixed-price contracts FESHM Chapter 7010.

V. Competence, Training and Awareness

Preparing Laboratory workers to perform their activities in a safe manner with regard for the environment is a vital part of the research effort (FESHM

4010). All employees and contractors working at Fermilab receive general training that includes environmental and emergency response information. Individual Training Needs Assessments (ITNAs) are generated for all employees. The ITNA assists in identifying the compliance-related training required for each employee. The management person most familiar with the employee's responsibilities and work environment completes it before the employee begins work. It is then updated any time new hazards are identified or brought into the work environment or reviewed occasionally, usually during the annual performance review, to aid in maintaining the validity of the information. This also ensures that the employee is aware of the potential hazards that may be encountered on the job.

Four modules have been developed to provide EMS training that is commensurate with the employee's responsibilities. The training includes the following modules with their learning objective:

1. General Awareness/New Employee Training – provide the general worker with an increased awareness of their potential workplace impacts on the environment and the motivation to "ReThink" how they work.

2. Construction Coordinator/Task Manager Training – provide individuals who are the first line of contact with subcontractors that are brought onto the Fermilab site to perform work with an increased knowledge of compliance and waste minimization/pollution prevention concepts. This module goes more in-depth to include compliance requirements and specific pathways for contamination of the environment.

3. EMS Team Training – provide individuals with specific training on the development and implementation of an EMS and the special requirements of Division/Section representatives.

4. Senior Management Training – provide senior management with a summary description of the EMS process, including their responsibilities as they apply to the successful implementation of an EMS and the expected benefits to be derived from such implementation.

Subcontractors are informed of their requirements under the system through Subcontractor Orientation training. Part of this training involves

presentation of information contained on the Subcontractor Information Sheet. Other elements are presented as part of their integration within other ES&H concerns.

Individuals within the ESH Section, Safety and Environmental Protection Group, Environmental Protection Team with responsibilities for regulatory oversight and all Environmental Officers have requirements within their Individual Training Needs Assessment to receive training on regulatory requirements.

VI. Communication

Mechanisms for communication, both within the Laboratory (horizontally and vertically) and with externally interested parties, are vital for the environmental management system to work efficiently and effectively. A major goal of communication is in recognition of environmental issues so that they can be addressed within the EMS. With regulations it is vital that accurate information on the requirements contained within a regulation or permit obtained as a result of a regulation be transmitted to all potentially affected or interested parties. Interested parties external to the Laboratory must have avenues by which they can access information that tells them what type of activities exist at the Laboratory, to what extent those activities affect the environment and what programs are in place within the Laboratory to reduce or mitigate those affects.

A major mechanism for communication besides verbal face-to-face exchanges, which is being relied upon more and more, is through electronic formats. The Internet provides a vast landscape for information management. Important documents are generated electronically and made available to necessary parties through the web. Access can be controlled so that availability is afforded those parties, either within the Laboratory or outside for the public, that have a reason to view and benefit from the information.

Internal communication of the environmental requirements and programs at the Laboratory occur through establishing availability of those documents that outline the issues required by responsible individual employees and by taking advantage of the opportunities for face-to-face verbal exchanges of ideas. The major documents detailing information directed to the entire employee

population are the Director's Policy Manual and the Fermilab ES&H Manual (see especially chapter 1010 – Laboratory Environment, Safety and Health Policy and Its Implementation). Other minor documents include reports and memos that circulate within smaller functional groups. General information intended for the entire Laboratory population is transmitted via the Fermilab Today, an electronic daily publication of the Public Affairs group. Verbal exchanges of ideas are made possible through committee meetings, training, and *ad hoc* conversations.

The major mechanisms for communication with outside interest groups are also electronically or verbally based, although most everything that is available electronically can be requested and provided in hardcopy. The ES&H Section has internal procedures that specify how calls from outside regulatory interest groups should be handled. The Director's Policy Manual contains policy statements that cover the necessity to demonstrate to the public the means to minimize or avoid the detrimental impact of scientific research on the environment and to foster environmental awareness in the community, the role of Public Affairs, as well as response to information requests made through the Freedom of Information Act. The Internet contains links to information about the Laboratory, in general as well as for specific topics that are available to the public. This includes the Fermilab Today.

Fermilab's environmental monitoring program consists of effluent monitoring and environmental surveillance. Its goal is to assist Laboratory management in decision-making by providing data relevant to impacts that Fermilab operations have on the surrounding environment. Effluent monitoring documents compliance with permits and is conducted at specific locations, while environmental surveillance is done on the potential pathways to receptors and is conducted at various locations. Data is collected for reporting purposes or whenever it is necessary or useful in conducting the business of the Laboratory. Data is maintained by the ES&H Section, Environmental Protection Team in a centralized database. The EP Team also develops and maintains Environmental Technical Notes relating to specific environmental topics. Annually the Laboratory publishes the Environmental Report to the Director. This document details the Environmental Protection Program, which establishes the policies and procedures to ensure compliance with regulatory requirements imposed by Federal, State and local agencies and with DOE orders, as well as providing for the measurement and interpretation of the impact of Laboratory operations on the public and the environment via the Environmental Monitoring Program. The

Laboratory also encourages face-to-face meetings between specified representatives and community groups.

VII. Documentation and Document Control

This includes establishing and maintaining information to describe the EMS, provide direction to related documentation, controlling documents, and identifying significant aspects and reporting the results of monitoring activities. It also deals with establishing and maintaining procedures for accidents and emergency situations.

The principal guide for retention periods is the retention schedules established by the National Archives (NARA) and DOE in support of federal regulations. Documentation linkages for Fermilab's EMS are contained mainly in this overriding FESHM chapter as well as FESHM chapter 1010 and the Fermilab IESHM Plan. All documentation associated with ES&H policies, work practices, exposure records, transportation of personnel and equipment, operations, exposure surveys, training activities, etc., must be retained indefinitely. Questions concerning retention of records are addressed through the Records Administrator in the Business Services Section. The management structure for document creation, maintenance, use, and disposition of records is handled in accordance with the Records Management Policies and Procedures Handbook. The handbook implements DOE Order 200.1 by providing step-by-step instructions for storing, retrieving and disposing of records. Procurement terms and conditions are included in packages to contractors and suppliers with language on environmental protection.

Conformance with document control elements is the responsibility of the individual Division/Section or line organization in accordance with FESHM 1051. Any organization with documents under the EMS will have procedures to ensure that documents meet the requirements of control to ensure that they can be located and that they are periodically reviewed, revised, approved and maintained up to date.

VIII. Operational Control

Operational controls are essentially procedures for ensuring that operations and activities are carried out under specified conditions or

performance standards and do not violate regulatory compliance limits. They include specific operating criteria or specifications in the case of equipment maintenance, pollution control equipment, and production processes which must be managed within specified parameters to achieve desired optimization.

In setting goals/objectives and targets, the EMP panel estimates the additional resources needed to achieve the levels desired through the EMP procedure (Appendix C). Operational controls established as part of developed targets are communicated through the EMP panel to the individuals responsible for completing the work activity as well as the appropriate management for approval. Appropriate management applies financial, operational, and organizational considerations to approve their incorporation into the IESHMS. At this point, the goals/objectives and targets have become formal goals/objectives and targets for the organization. The operational controls will be documented procedurally where an absence of documentation could lead to a deviation from the policy, objectives and targets. The procedures will stipulate the operating criteria. Where appropriate, procedures will be established, implemented and maintained that relate to the identified significant environmental aspects of goods and services and communicated to suppliers, including contractors.

XI. Emergency Response and Preparedness

The identification of potential emergency situations and potential accidents that can have an impact(s) on the environment and appropriate mechanisms of response are outlined in the FESHM Chapter 2040 and General Emergency Information. The FESHM chapter provides a general description of Fermilab's emergency preparedness program which is detailed in the Fermilab Emergency Response Plan (ERP), Fermilab Hazard Assessment Document, and local emergency procedures. The purpose of the ERP is to establish and document overall policy and assign and describe the organizational structure, interfaces, resources, decision-making processes and actions for the Emergency Management System. It provides the framework for comprehensive and integrated planning, preparedness and response to serious abnormal incidents involving the environment.

X. Monitoring and Measurement

Effective monitoring and measuring provides essential mechanisms for evaluating environmental performance, analyzing root causes of problems, assessing compliance with legal requirements, identifying areas requiring corrective action, and improving performance and increasing efficiency. Pollution prevention and other strategic opportunities are identified more readily when current and reliable data is available.

All key characteristics of operations that can have a significant environmental impact will have a procedure(s) established, implemented and maintained, when appropriate, for monitoring and measuring. The procedure(s) will include the documenting of information to monitor performance, applicable operational controls and conformity with the objectives and targets.

XI. Evaluation of Compliance

Compliance elements of Fermilab's EMS are listed in the flow chart in Appendix A. The Fermilab Self-Assessment Program Plan sets forth the Laboratory expectations for line self-assessment and independent oversight of the ES&H program. FESHM chapter 1040, ES&H Self Assessment Program, also covers ES&H appraisals and audits, both internal and external, which are conducted to assess and document compliance with ES&H policies, permits and regulatory requirements. The chapter covers appraisals and audits at four different levels, DOE Headquarters Reviews, DOE/FSO Group Reviews, Inspections by External Regulatory Agencies and the Fermilab Self-Assessment Program.

XII. Nonconformity, Corrective Action and Preventative Action

As an EMS is implemented, managers may find various system deficiencies. This is normal and to be expected. No system is perfect. The important thing is to establish a process to assess the root causes of the deficiency and to take corrective actions to remediate the problem. It is important to assess the corrective actions as well, to determine if they are effective in remedying the deficiency. If not, the problem itself may not have been accurately diagnosed. Continuing or multiple deficiencies may indicate some fundamental, systemic deficiencies that warrant further examination and response. Checking and corrective action are typically ongoing activities.

Environmental Lessons Learned

Environmental Lessons Learned exercises shall be conducted by the EP Subcommittee to identify programs, procedures or designs that have resulted in an incident that either causes or has the potential to cause an environmental non-compliance or contamination of environmental media, as outlined in FESHM Chapter 3020, Incident Investigation. A subset of the subcommittee, made up of subcommittee members and employees with specific subject matter expertise that can aide in the investigation, shall perform these exercises. There are many benefits from such an investigation, with the ultimate being prevention of environmental impacts. Preventative methods are most effective when all incidents are reported promptly, thoroughly investigated and the root causes identified. The depth of an investigation should be dependent on its potential to cause more severe damage should the incident recur. It is important to emphasize that Lessons Learned investigations are not fault finding exercises but rather fact finding. Reports should be written and made available so that persons not familiar with the activity may understand and gain knowledge from the report.

Significant and Reportable Occurrences

It is important that Laboratory management and the Department of Energy be appropriately notified of all events which could adversely affect the environment. The process for reporting appropriate events are contained in the FESHM Chapter 3010, Significant and Reportable Occurrences. This procedure also outlines how to categorize events as well as investigate occurrence and generate and submit reports.

Preventative Action

Preventative action is incorporated into the corrective action program through the processes outlined in the following referenced FESHM chapters (1040, 3010, 3020 and 3030). These mechanisms provide information that can be used in evaluation of occurrences and projection of potential preventative actions for future projects. FESHM Chapter 3030, Noncompliance Tracking System, specifically points out in the responsibilities section that the Price Anderson Amendments Act (PAAA) Coordinator conducts quarterly reviews of reported incidents, inspection reports, and program reviews to identify programmatic trends.

XIII. Control of Records

The value of records management lies in the ability to demonstrate that the EMS is being implemented as designed. While records have value internally they also provide evidence of EMS implementation to external parties. The EMS would be difficult to operate in a consistent manner without accurate records. For records management, the process begins with a determination of what records need to be kept, how they will be kept and for how long. Records are a form of documentation and are dealt within the same mechanism as document control (refer to Section VII).

XIV. Internal Audit

The Fermilab Self-Assessment Program Plan sets forth the Laboratory expectations for line self-assessment and independent oversight of the ES&H program. FESHM chapter 1040, ES&H Self Assessment Program, also covers ES&H appraisals and audits, both internal and external, which are conducted to assess and document compliance with ES&H policies. The chapter covers appraisals and audits at four different levels, DOE Headquarters Reviews, DOE/FSO Group Reviews, Inspections by External Regulatory Agencies and the Fermilab Self-Assessment Program.

ESHTRK is a database that is used at Fermilab primarily to support ES&H performance monitoring and follow-up of associated issues. However, this system can also accommodate a wide variety of non-ES&H applications, and its general use is strongly encouraged. Although issue-tracking systems are often viewed as large "to do lists," they can also provide valuable information about the status of associated programs. In particular, ESHTRK plays a key role in monitoring the status of Fermilab's self-assessment program. FESHM chapter 1040 contains the Lab's policy regarding its use as well as associated implementation procedures.

XV. Management Review

Management must periodically step back and evaluate the performance of the EMS as a whole. This review offers a great opportunity to ensure its continuing suitability, adequacy and to keep the EMS efficient and cost effective. The requirements of the management review process are conducted through the Laboratory Safety Committee. The LSC is chaired by the Directorate (Chief

Operating Officer) and is composed of members that include 1) ex-officio member, the Senior Laboratory Safety Officer, 2) the chairperson of each subcommittee established within the LSC, and 3) a representative of each Division/Section. This committee has the responsibility for reviewing all safety policies and programs and for reporting its findings and recommendations to the Laboratory Director. The Committee coordinates the activities of reviews of ES&H policies of general Laboratory-wide significance as well as reviews of ES&H aspects of Laboratory activities that may be of concern to the public. The management review system is performed and tracked by this Committee through the Self-Assessment process. A management review will be conducted annually and will include an assessment of opportunities for improvement and the need for changes to the EMS, including the environmental policy and environmental objectives and targets.

Input to the review will include the following:

1. results of internal audits and evaluations of compliance with legal requirements and with other requirements to which the organization subscribes,
2. communication(s) from external interested parties, including complaints,
3. the environmental performance of the organization,
4. the extent to which objectives and targets have been met,
5. status of corrective and preventive actions,
6. follow-up actions from previous management reviews,
7. changing circumstances, including developments in legal and other requirements related to its environmental aspects, and
8. recommendations for improvement.

Output from the review will include the following:

1. any decisions and actions related to possible changes to the environmental policy,
2. any decisions and actions related to possible changes to objectives and targets,
3. any decisions and actions related to possible changes to other elements of the EMS consistant with the commitment to continual improvement.

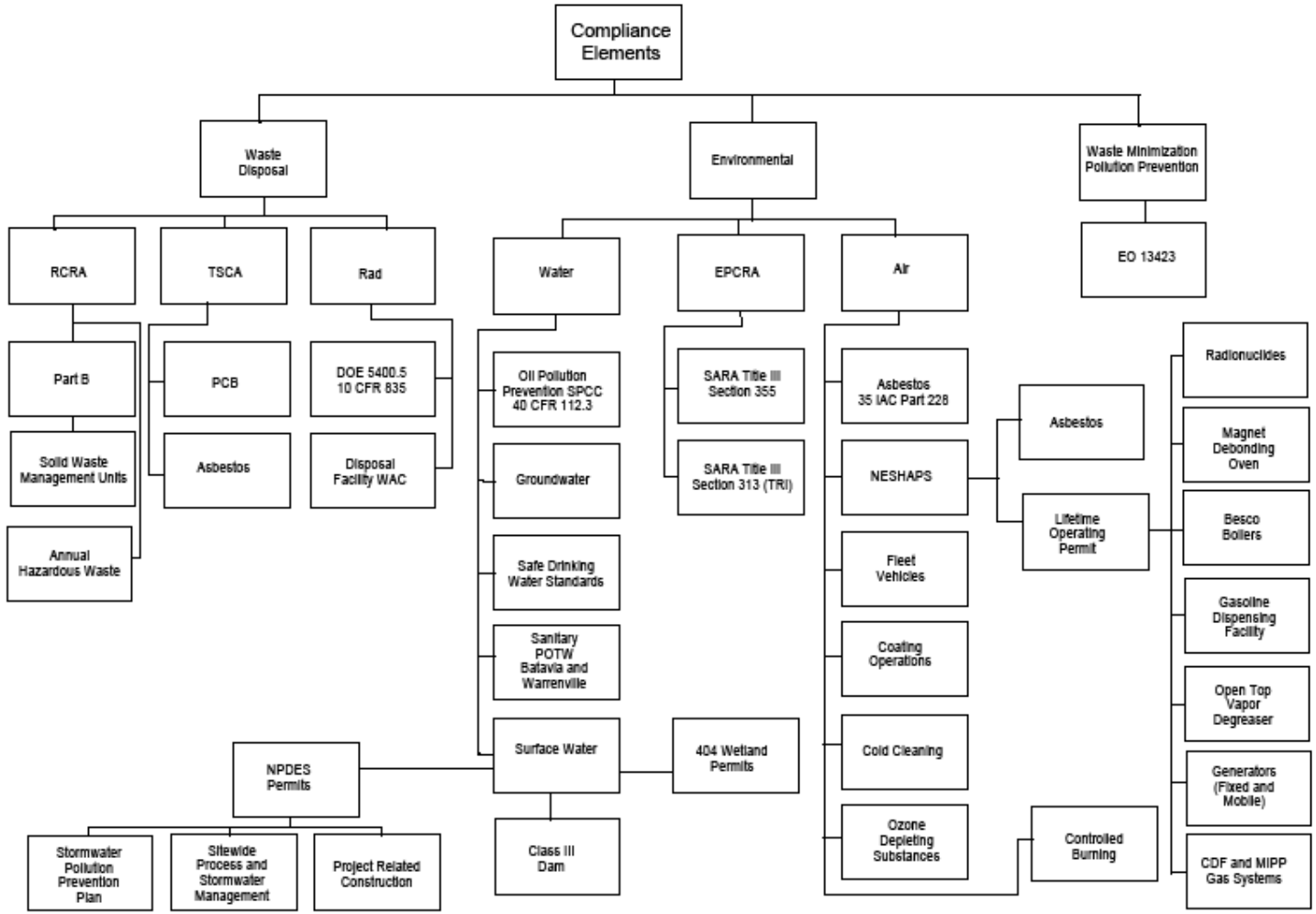
Higher level reviews of ES&H activities are also performed by Fermilab's governing board. FRA has established an ES&H Subcommittee of the Board of Directors. This committee meets each quarter with representatives of the

Directorate and the Senior Laboratory Safety Officer and his/her staff to review current ES&H performance. The results of the subcommittee's deliberations are reported to the full assembly of the Board.

Appendix A

Fermilab Environmental Management System
Compliance Elements

Fermilab Environmental Management System



Appendix B

Procedure for Determining Goals/Objectives, and Targets

Procedure for Determining Goals/Objectives and Targets

Goals/objectives and targets are set within significant aspect categories by the Environmental Protection Subcommittee through the framework of the Environmental Management Program. Any number of environmental management programs may be developed, with corresponding goals/objectives and targets; within a particular aspect category. Goals/objectives and targets may be set to maintain an attained level of achievement for a given aspect or other EMS element. Targets need not be specified where it is sufficient to specify the objective alone. Where appropriate, the EP Subcommittee sets targets for each objective to further define the incremental tasks necessary to achieve objectives. Targets also include dates when objectives will be achieved.

Goals/objectives and targets must be consistent with the commitments in the Director's ES&H policy. Furthermore, in setting goals/objectives and targets, the following will be considered:

- the views of interested parties,
- the prevention of pollution,
- compliance with applicable regulations,
- the achievement of continual improvement,
- technological options, and
- financial, operational, and organizational requirements.

Other considerations in setting objectives include quantification and time frames. Whenever possible, objectives should be set in quantitative terms with specific time frames for accomplishment to facilitate measurement, performance monitoring, and trends analysis. However, quantification is not a requirement of objectives and measurability is possible without quantification. Fermilab may set objectives for elements within significant environmental aspects irrespective of their ability to be quantified. In some cases, quantification may not be possible because an environmental aspect element has not been previously measured, and therefore there is no baseline against which to measure performance. In these cases, the first cycle of measurements will act as a baseline against which to quantify future performance.

Targets describe in detail how objectives will be achieved, including the operations that will contribute to an objective and the dates by which they

should be achieved. Targets can provide performance metrics in cases where objectives cannot be quantified. For example, where an objective is to develop a plan to replace hazardous chemicals with less hazardous substitutes, the first target may be to complete a draft plan within 6 months of setting the target; the second target may be to finalize the substitution plan within 1 year. The achievement of these targets then becomes the metric by which performance is measured. Again, measurability is often possible even when quantification is not.

Fermilab will establish performance indicators (measures) when setting goals/objectives and targets and will include these within the environmental management program documentation. Performance indicators will be set for all goals/objectives and targets. These may include performance indicators for environmental performance, compliance, pollution prevention, and for other EMS elements of the IESHMS for which we have established goals/objectives and targets. Performance indicators will be tracked as part of the environmental management programs to ensure that goals/objectives and targets are on track for attainment within the specified timeframes.

Progress toward achieving the goals/objectives and targets should be sufficient over time so that the end goal can be met in accordance with the timeline specified in the environmental management program. This is important so as to demonstrate that the IESHMS is being effective in achieving all its intended purposes, most importantly including the achievement of goals/objectives and targets.

Fermilab will not set goals/objectives and targets for non-significant environmental aspects. However, from time to time, Fermilab will survey the employees' environmental awareness and their commitment to conducting their tasks in environmentally sensitive ways. The results of these surveys will measure the overall environmental culture that prevails at and is relied upon by Fermilab to address the non-significant environmental aspects.

Records

The EP Subcommittee will create and maintain records that pertain to the setting of EMS goals/objectives and targets for the IESHMS. This will be done

through the use of the Environmental Management Program (EMP) Form. Information required for the form includes:

1. Date that the EP Subcommittee accepts the form.
2. Log # determined by year and sequential number (ex: 2007001).
3. The individual that was responsible for generating the form.
4. The Division/Section that the responsible individual resides.
5. The environmental objective. This should be a short narrative statement of what the problem and the fix are, and should begin by stating the Significant Aspect and Element. Objectives should be measurable with quantitative goals.
6. The target date set for completion of the objective.
7. The action plan.
    a. How will the objective be set? This information includes what the plan is for getting from where we are to where we want to be. It should include information designating responsible individuals and target dates for each step of the plan.
    b. What operation controls will support achieving this objective? This includes information on any procedures that need to be developed or changed, additional training requirements and any coordination links that need to be established.
    c. How will this objective be tracked? This includes the need for sampling and analysis or tracking of reports or noncompliance.
    d. What resources that will be required to achieve this objective? This includes the necessary financial and/or personnel requirements.

All EMPs will require signoff from upper management before being officially accepted as programs. These will include the EMS Coordinator, ES&H Section Head, and Chief Operating Officer.

Appendix C

Letter of Declaration from Facility Manager to Office of Science

DEC 0 2 2005

Raymond L. Orbach, Director
Office of Science
SC-1 FORS

SUBJECT: ENVIRONMENTAL MANAGEMENT SYSTEMS DECLARATION FOR FERMI NATIONAL ACCELERATOR LABORATORY

Pursuant to Department of Energy (DOE) Order 450.1, Section 5.d. (1), I am reporting to you that I have determined that the Fermi National Accelerator Laboratory (Fermilab) fully conforms to the Environmental Management System (EMS) requirements of DOE Order 450.1. I base my determination upon the results of a second-party assessment, which I requested as a component of my implementation of DOE Policy 450.5, Line Environment, Safety and Health Oversight.

The second-party assessment of the Fermilab EMS used the self-declaration procedure described in Attachment 2 of draft DOE Guidance 450.1-1A. The EMS Assessment Plan contains the specific lines of inquiry used to evaluate the adequacy of the EMS and its implementation. The Fermilab EMS Assessment Final Report includes the EMS Assessment Plan as an attachment. Using the second-party assessment, I confirmed that Fermilab has updated its approved description of its Integrated Safety Management System (ISMS) to include the EMS requirements of DOE Order 450.1.

I also confirmed that Fermilab has the appropriate ES&H performance objectives, performance measures and commitments incorporated into its ISMS/EMS and includes the appropriate environmental elements based on the environmental risks and impacts of the activities of the site and established Departmental pollution prevention/energy efficiency goals.

In addition, the Fermi Site Office (FSO) uses the following mechanisms to ensure that the requirements of DOE Order 450.1 are being (and will continue to be) implemented: FSO participation in the periodic review and comment on future revisions of Fermilab Environment, Safety and Health (ES&H) Manual Chapter 8010, "Environmental Management System," dated May 2005; FSO participation in the annual review, comment and approval of revisions to the "Fermilab Integrated ES&H Management Plan", which incorporates Fermilab's EMS; FSO participation in an annual EMS management review through the Fermilab Tripartite self-assessment program; and FSO participation in monthly Environmental Protection Subcommittee meetings and other environmental operational awareness activities.

In summary, I have reviewed Fermilab's

- environmental policy,
- approved ISM system description, including EMS,
- current list of significant aspects, and
- current measurable goals, objectives and targets,

and I have determined that Fermilab has implemented an EMS that meets the requirements of DOE Order 450.1.

The Fermi Site Office maintains documentation supporting this determination, including the Fermilab EMS Assessment Final Report and EMS Assessment Plan. The documentation is available for review by the Office of Science and the Office of Environment, Safety and Health.

Original Signed by
Dr. Joanna M. Livengood
Site Manager

Joanna M. Livengood
Site Manager

cc: John Spitaleri Shaw, EH-1, FORS

bc: D. Erbschloe, SC-3, FORS
A. Edelman, SC-31.1, GTN
J. DiMatteo, CH
J. Cooper, FSO
S. Arnold, FSO

Appendix D

ISO 14001 Certification

NSF International Strategic Registrations

789 North Dixboro Road, Ann Arbor, Michigan 48105
(888) NSF-9000

Certificate of Registration

This certifies that the Environmental Management System of

Fermi National Accelerator Laboratory

Batavia Rd
P.O. Box 500, MS-119
Batavia, Illinois, 60510-0500, USA

has been assessed by NSF-ISR and found to be in conformance to the following standard(s):

ISO 14001:2004

Scope of Registration:

Research and development, manufacturing, waste management, and site infrastructure management at all facilities on the FNAL property in accordance with the current U.S. Department of Energy contract.

Industrial Classification:

IAF:	34
SIC:	8733, 871
NACE:	

Certificate Number:	6M111-51
Certificate Issue Date:	21-Aug-2007
Company Initial Date:	07-Aug-2007
Registration Date:	07-Aug-2007
Expiration Date*:	06-Aug-2010

Christian B. Lupo, General Manager
NSF-ISR, Ltd.

Appendix E

Methodology for Conducting Process Assessments for Compliance Status and Pollution Prevention Opportunities

Process Assessments for Compliance Status and Pollution Prevention Opportunities

Introduction

Fermilab, like private industry, must comply with all EPA requirements as well as State and local regulations. Legislation that controls our requirements is found in acts such as the Clean Air Act, Clean Water Act, Toxic Substances Control Act, and Resource Conservation and Recovery Act. These requirements are then detailed in regulations contained in the Code of Federal Regulations, Illinois Administrative Code and local ordinances. Knowledge of activities that fall within the control structures of these acts is vital for reducing potential violation notices and maintaining the laboratory's status within the Federal, State and local communities.

Our environmental programs should not only ensure long-term compliance, but with the development of our Environmental Management System and registration under ISO14001 also act proactively and set goals for pollution prevention and waste minimization. Pollution prevention is the process of reducing or preventing pollution at the source through changes in production, operation, and materials use. It can result in reduced materials usage, pollution control, and liability costs as well as help protect the environment and may reduce risks to worker health and safety.

Goals should be set within the available mechanisms that cover the overall laboratory down through the individual Divisions and Sections to the line work levels to assess compliance and opportunities for specific processes and arrive at a level of assurance of compliance and development where practicable of a specific list of actions which can be implemented to prevent pollution.

This technical appendix provides line management and line level employees with tools and techniques for reviewing processes in their areas to identify compliance issues and in identifying and generating pollution prevention opportunities.

Step 1: Identify and Select the Process(es)

The first step in this methodology is to select the process(es) for evaluation. This methodology can be performed at the building level and encompass a large number of processes, or it can be focused down to a specific process. The best

place to begin is with the highest priority process(es) based on communication with the Division/Section ES&H organization. If there are several such locations, it may be best to begin with a process that generates a waste, emission or effluent that is significantly more of a potential impact than other processes. An important consideration when identifying and selecting processes is to be sure and keep the scope of the assessment at a manageable level. Trying to evaluate too many processes all at the same time can strain resources and reduce the overall quality of the assessment.

Step 2: Select the Team

Once the process(es) have been selected, it is time to build the assessment team. The team should consist of a variety of individuals with different backgrounds and skills and ideally should contain a balanced mixture of personnel from the area(s) responsible for the process(es) [including workers, supervisors, and environmental staff]. If multiple processes are being evaluated it may be beneficial to build a core team of personnel and then supplement this core team with personnel from the areas responsible for each process. An important consideration in selecting the team is time. Conducting an assessment on even one process can take a significant amount of effort once the time needed to collect the background information, identify alternatives, research necessary permitting requirements, etc. is factored in. Team members need to have the commitment of their management to see the assessment through to its completion.

Step 3: Examine the Process

To examine the process it is important to characterize all aspects of the process or operation including sequencing of the steps in the process, waste generation patterns, material and energy consumption, costs, manpower, permitting, and reliance on hazardous/toxic chemicals. This can be accomplished by conducting site visits, interviewing staff, reviewing records, and collecting specific information concerning the process. Include visits to the shop storage areas, waste storage areas, and equipment areas. During this process, it is important to identify impacts that the process(es) and related wastes have on the air, water, and land. There can be a tendency to evaluate processes by first identifying the waste streams and then tracing them back to where they are introduced into the process. However, in doing this it is easy to miss materials that are consumed within the process including water and electricity. A better method is to start at the beginning of the process and then trace it step by step until its conclusion.

Prior to visiting the area, it is important to gather the following information:

- A listing of all hazardous materials issued to the area in the last 12 months;
- A copy of all hazardous waste pickup request forms from the preceding 12 months;
- Copies of all current permits for this area;
- Listing of water and energy usage, solid waste disposal volumes/costs, and wastewater disposal volumes (if available);
- An organizational chart and area roster;
- Any available process flow charts;
- Any previous assessments performed.

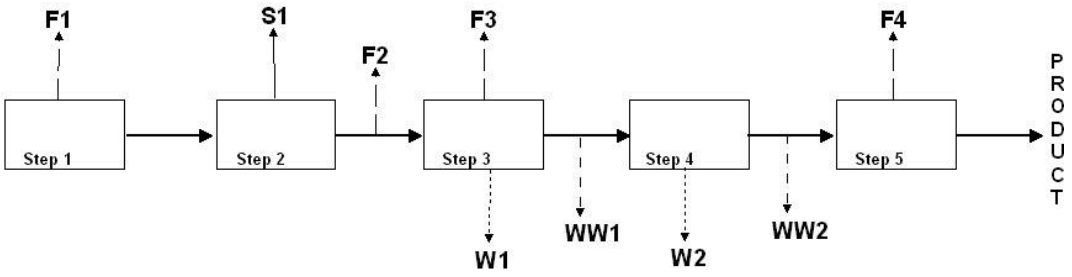
Very often area personnel are unclear as to how much material is used and how much waste is generated in performing the steps associated with a particular task, but their best guess is usually better and more accurate that computer data. Thus, the hazardous materials issued and hazardous waste pickup request forms are extremely useful for characterizing the steps in the target process(es) because they are the most reliable measures of the inputs and outputs associated with performing the process tasks. Combining the information from these lists, along with knowledge of how often a particular process is performed and the composition of the hazardous materials, can lead to fairly accurate estimates of the inputs and outputs of the process each time it is performed. Water and energy usage logs, as well as solid waste disposal volumes/costs and wastewater disposal volumes may not be readily available unless individual buildings are metered. Regardless, every effort should be made to quantify this information during the area visit in order to conduct adequate cost/benefit analyses later in the assessment process.

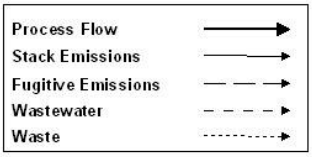
Step 4: Establish a Baseline

All assessments require a baseline from which to conduct comparisons against alternatives. The first step in preparing the baseline is the creation of a process flow diagram. The diagram should describe the steps in the process, and identify all of the materials used and the wastes generated. The next step is to assign material and waste quantities to the diagram. These quantities must balance in the process; in other words, whatever goes into the process must come out either as part of a product or as a waste. It is also important to note in the

diagram whether a specification requires any of the materials used as this may limit potential alternatives.

Sample Process Flow Diagram





Source Data Table

data in pounds

	Benzene	Toluene	n-Hexane	Xylene
F1	70	300	300	300
F2	90	400	395	400
F3	110	500	495	500
F4	70	300	300	300
Fugitive Air Emissions	*340*	*1,500*	*1,490*	*1,500*
S1	335	1500	1485	1490
S2	445	2000	1980	1990
Stack Air Emissions	*780*	*3500*	*3465*	*3480*
WW1	135	600	595	595
WW2	110	500	495	500
Water Discharges	*245*	*1100*	*1090*	*1095*
W1	220	1000	990	995
W2	490	2200	2180	2185
Waste Generation	*710*	*3200*	*3170*	*3180*
TOTAL	**2,075**	**9,300**	**9,215**	**9,255**

Step 5: Determine Adequate Permitting Compliance

Once knowledge of the outputs has been diagramed it is possible to make a determination of whether the proper permitting has been obtained for the process(es). The Division/Section Environmental Officer in conjunction with the ES&H Section Environmental Protection Group can perform an analysis of the outputs to current regulatory requirements to make the determination if current permitting is adequate or if modifications need to be made to existing permits to accommodate the effluent or emission.

Step 6: Identify Opportunities

This step in the assessment process can be the most difficult. Once everyone on the team has reviewed the process flow diagram, it is typical to have a "brainstorming session" in which the entire process is reviewed and ideas are solicited as to how the process could be changed. It is important at this stage not to discount any ideas as being too outlandish; alternatives that are not truly feasible will eventually be removed from consideration. Once a list of potential opportunities has been prepared, research needs to be conducted to obtain information necessary to evaluate them and make final selections. There are a number of excellent resources available for finding information on potential opportunities. The USEPA has several helpful references that can be accessed from their website at http://www.epa.gov.

Step 7: Rank Opportunities

The purpose of ranking opportunities is to see if they merit further consideration for implementation. The team needs to establish a standard set of criteria, based on the existing process, and against which it will evaluate the list of P2 opportunities. Selecting the criteria is an important task because they need to provide a consistent basis for justifying and funding future projects. Typical criteria include:

- Cost;
- Health and safety of the workers performing process:
- Environmental impact(s) including;
    - Relative amounts of waste streams;
    - Relative toxicity of waste streams;
    - % of existing waste stream that would be prevented;
    - Regulatory status of waste stream before and after change;
    - Potential for waste stream recyclability or reuse;
- Changes in labor requirements to perform work;
- Feasibility of implementing the opportunity; and
- Impact on mission.

A decision matrix is then constructed in which each of the potential opportunities is scored against the standard criteria. Typically a scale of 1 – 10 is used with 10 being the most desirable, 1 being the least desirable, and 5 being neutral.

Example: Metal Parts Degreasing

Options:

1. Procure an aqueous parts washer
2. Switch cleaner
3. Continuing current practice

Procuring an aqueous parts washer may score high in the environmental impact and health categories because the cleaning solution is nontoxic, but low in the labor and mission impact categories because it takes longer to clean the parts and then dry them.

Switching from one cleaner to another may score high in cost, but low in health and environmental impacts if it does not completely eliminate the necessity for personal protective equipment, requires modification in the existing air permit and still must be disposed of as a hazardous waste.

It is important to remember that each opportunity is scored against the criteria, and hence against the current process, not against one another.

At the end of the scoring exercise, the total scores for each potential opportunity are determined, they are ranked from best to least, and a list of recommendations is prepared.

Post Assessment Activities

The team's work is essentially finished upon completion of the decision matrix and the ranking of the potential opportunities and determination of compliance status. From this point, the focus shifts primarily to those individuals responsible for advocating environmental initiatives, the Environmental Officer. This individual will take the recommendations from the team, make the necessary recommendations to management, make determinations along with the ES&H Section of any potential permit modifications and if accepted develop the Environmental Management Program.